Mars Reconnaissance Orbiter

Flight System Overview

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Flight System Manager
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- **Rules of the Road:**
  - The International Trafficking in Arms Regulations are a real issue for the MRO Project, especially given our international science team.
  - NASA has a Letter of Agreement with ASI that allows JPL to transfer information to ASI and its subcontractors on issues related to the Flight and Ground system INTERFACES.
  - LMAO and other organizations are NOT covered by this LOA.
  - Other organizations must obtain their own export license to provide information to foreign nationals or foreign organizations.
  - Technical information about the internal working of these systems may not be transferred to any foreign nationals by any U.S. Citizens.

- **While at the PSG:**
  - Foreign Nationals have Blue Badges
  - LMAO personnel have white badges with yellow highlighting
  - There will be NO conversations between these groups.

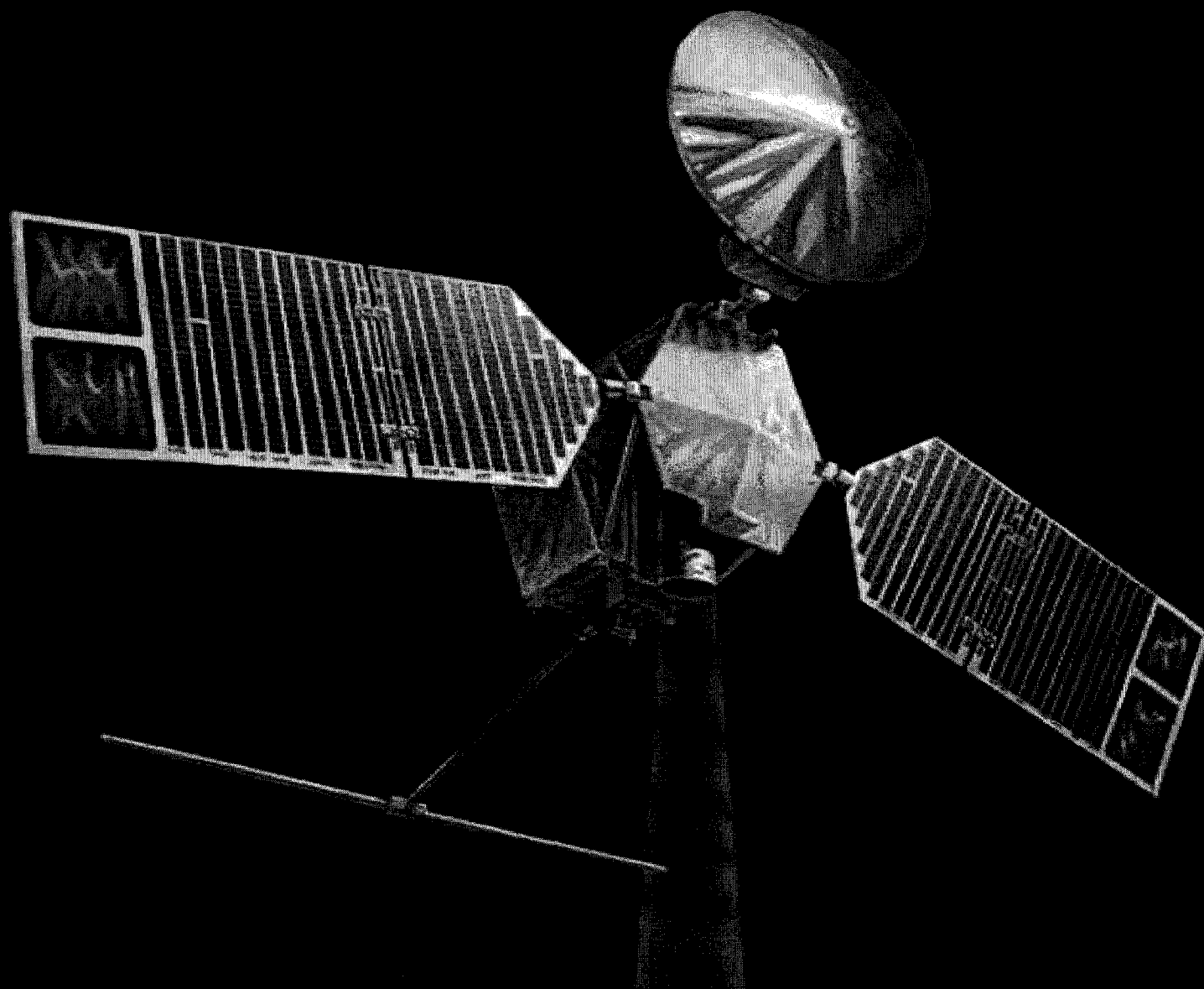| JPL	FLIGHT SYSTEM	LMA
Howard Eisen	Orbiter Manager	Kevin McNeill
Todd Bayer	System Engineer	Steve Jolly
Kirk Breitenbach	Requirements	Dave Perkins
Jeff Weiss	Structures, Mechanisms, Thermal, Propulsion	Tim Gasparrini
Steven Lee	Software, ACS	Chris Brosious
Steven Lee	C&DH, Power	Ken Bernhardt
Stan Butman	Telecom	Marty Schmitzer
Arden Acord	Integration and Test	John Henk
Phil Barela	Mission Assurance	Regina Palmer

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- JPL Science and Payload Office
  - Bill Mateer, Deputy Office Manager
  - Carl Kloss, System Engineer
- Flight System
  - Tim Girard (LMA), Payload Accommodations Lead
  - Kirk Breitenbach, Requirements
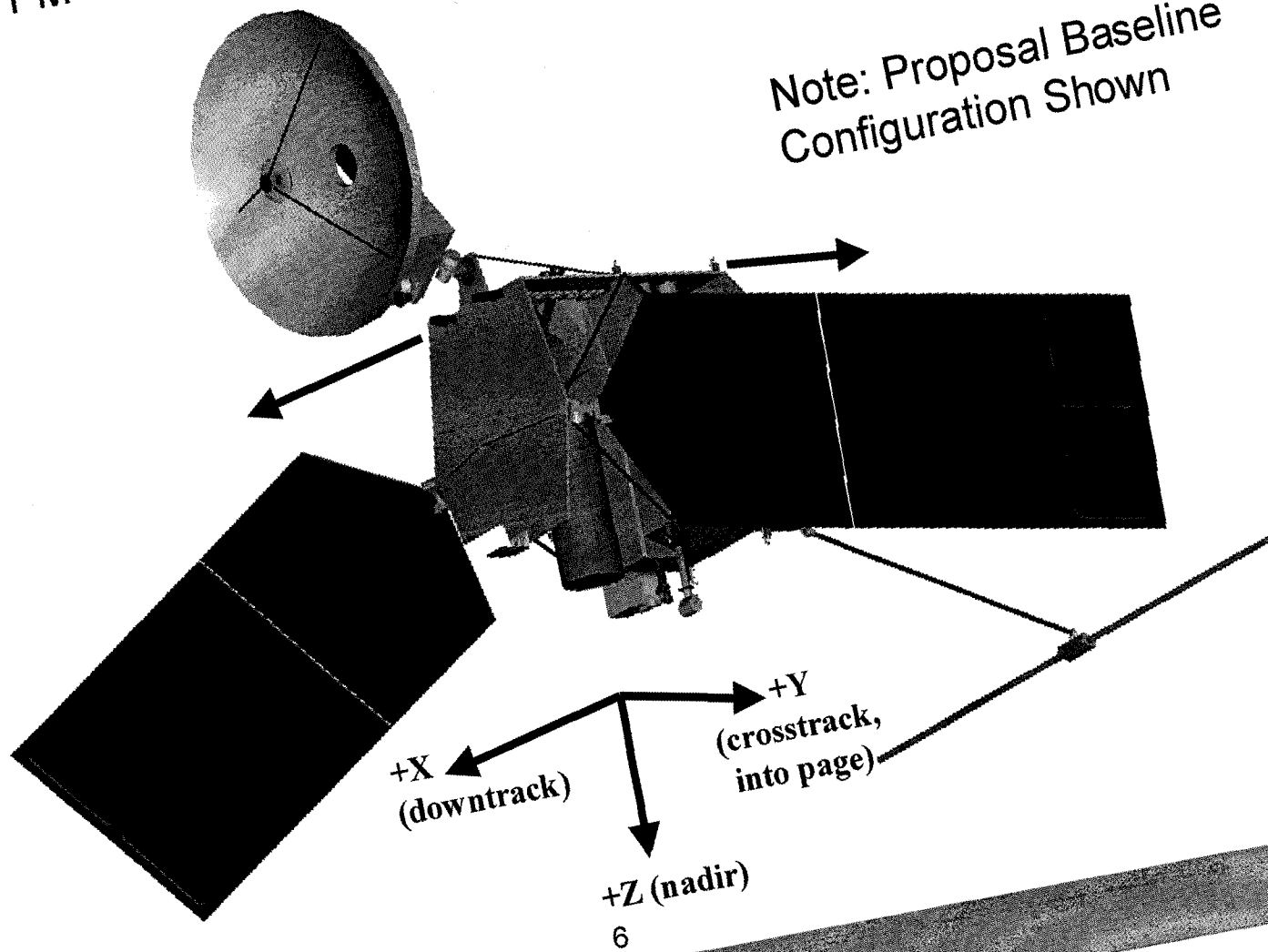
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Mars Reconnaissance Orbiter Flight System

Mapping: 3 PM LMST ascending node, 200x400 km 'traveling' periapsis

Note: Proposal Baseline Configuration Shown

+Y (crosstrack, into page)
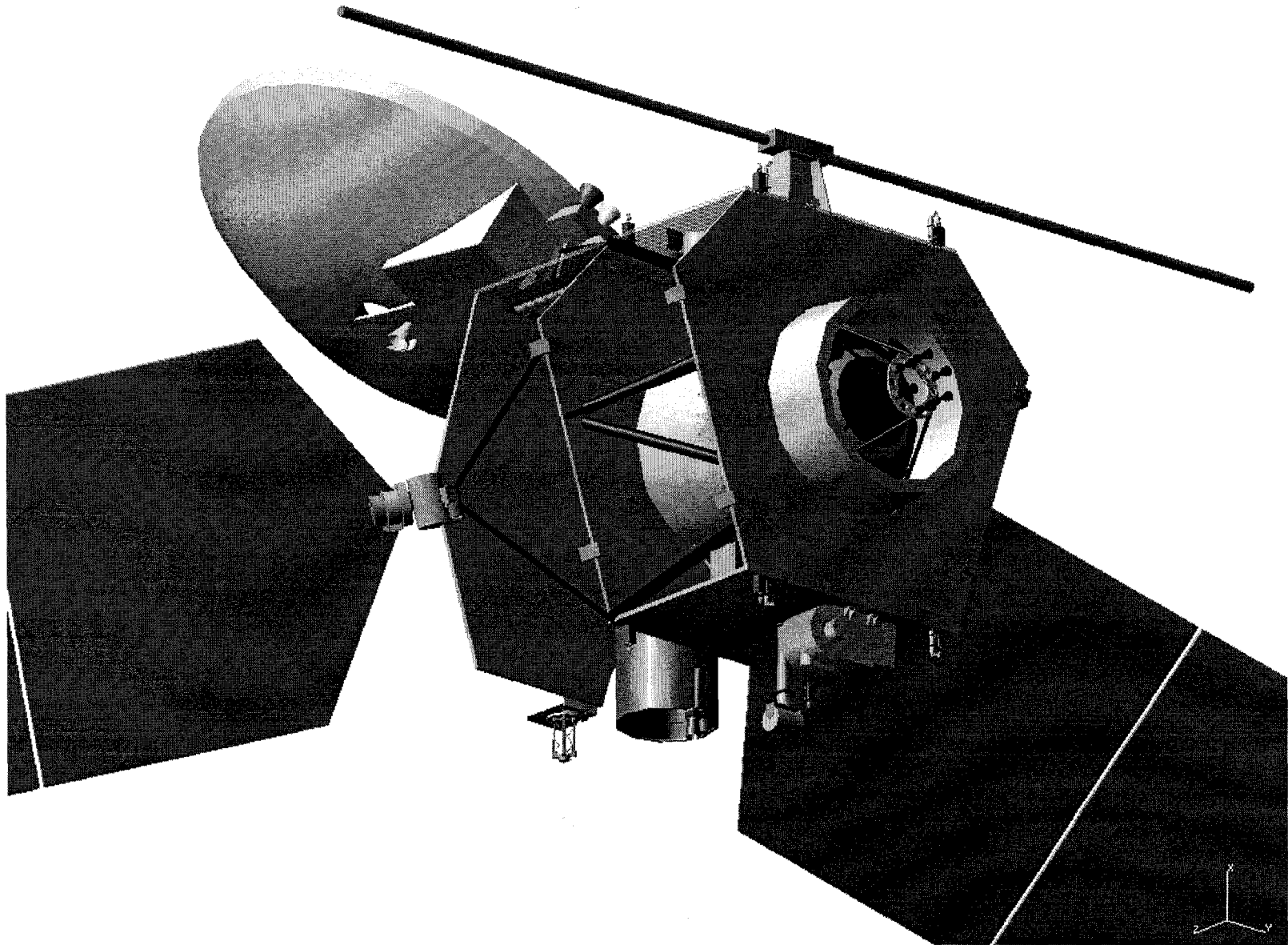
+X (downtrack)

+Z (nadir)

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Mars Reconnaissance Orbiter Flight System

HiRISE-IEB

HiRISE-Telescope

MARCI

CRISM-DPU

CRISM-OSU

MCS

Op Nav Cam

Context Imager

SHARAD

HGA is on –Y side of S/C

+X (downtrack, Parallel to page)

+Y (crosstrack, Into page)

+Z (nadir)

CRISM

MARCI

MCS

HiRISE

Context Imager
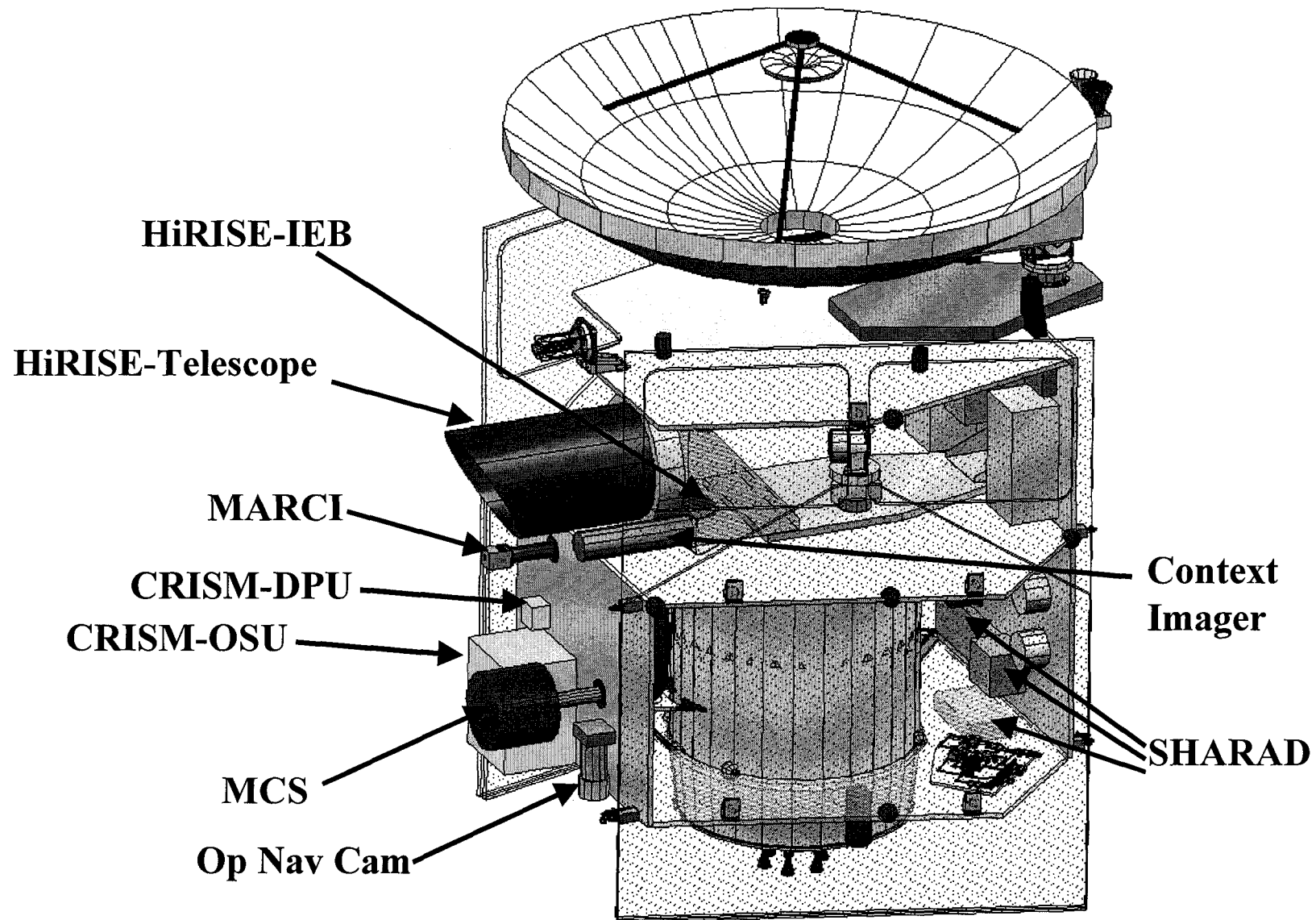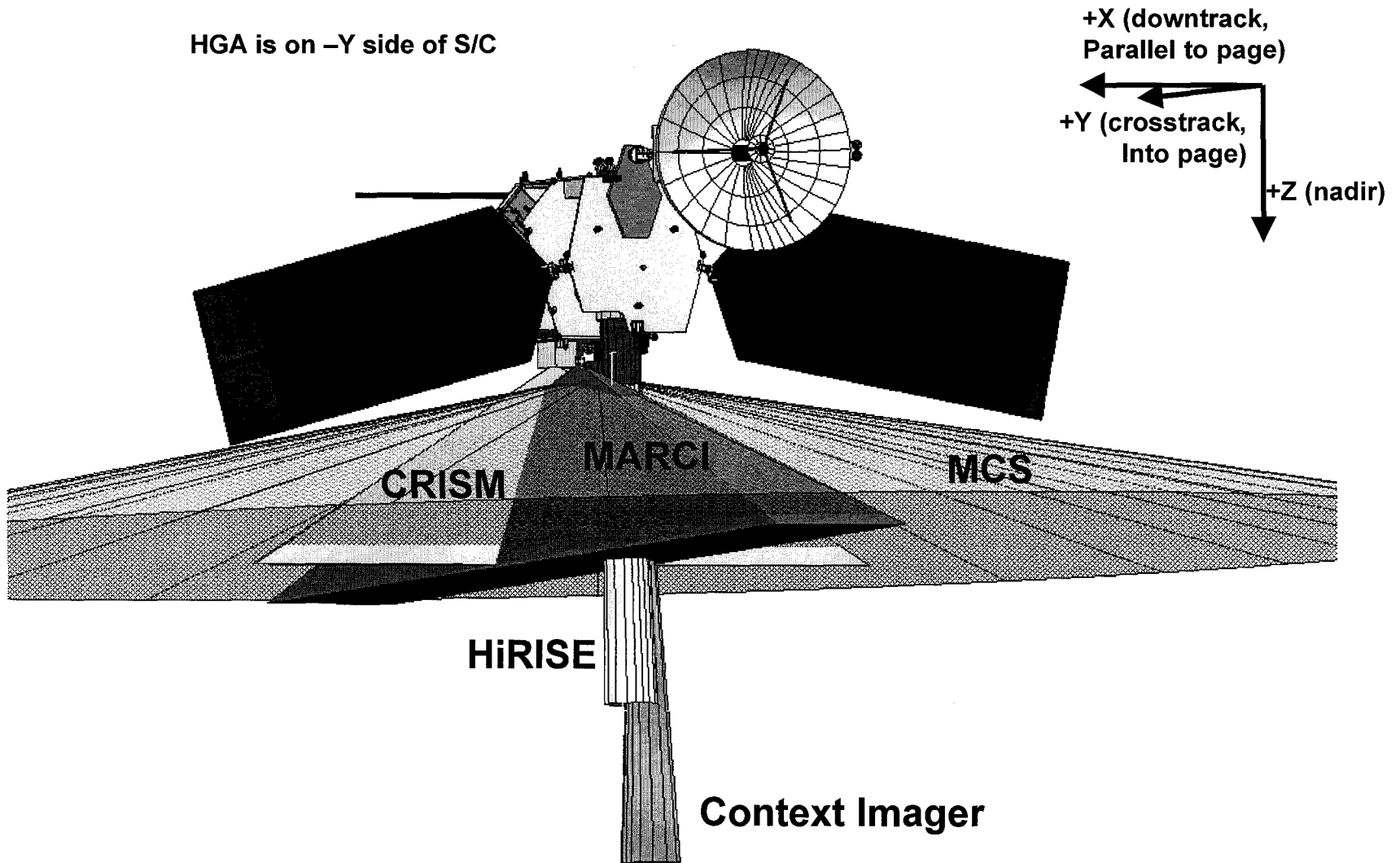
- **Command and Data Handling Interfaces**
  - LVDS command and data interfaces used by all payloads (except MARCI)
    - MCO Style Custom Interface for Heritage MARCI - TBC
    - Selectable LVDS data rates of 0.5, 1, 2, 5, 10, 30 or 100 Mbps
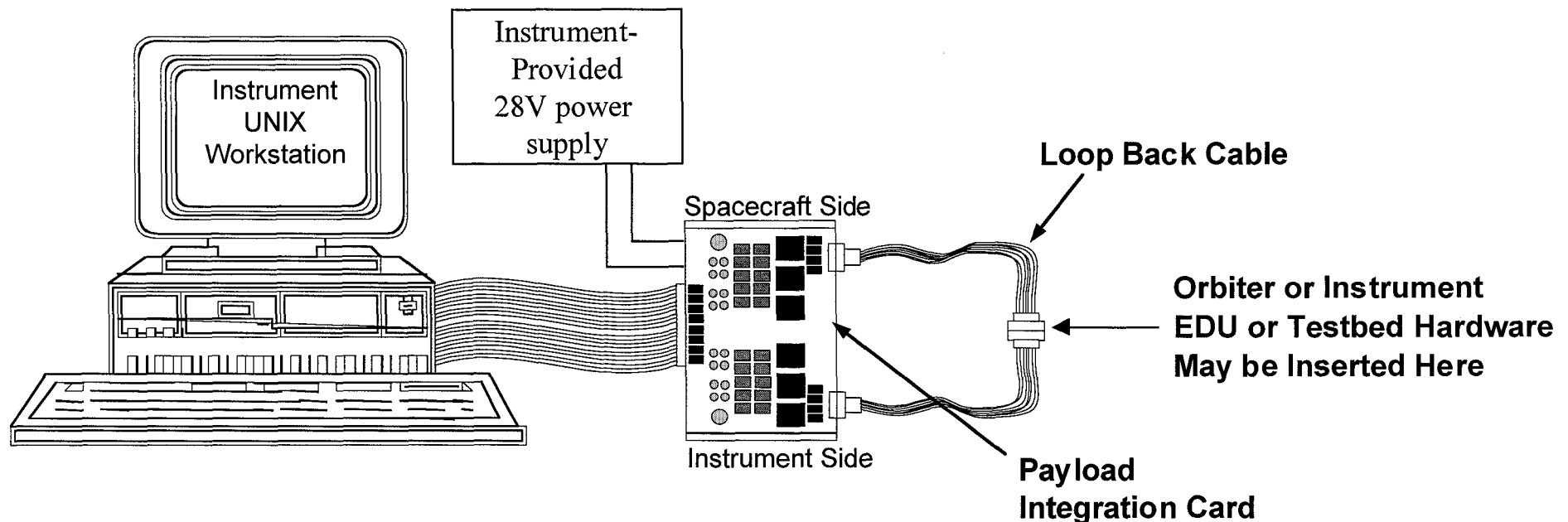   - 100 Mbps Max Composite Data Rate (shared between all users)
    - 0.5 Mbps command interface
    - LVDS Hardware/Software Protocol Currently in Definition

  - Discrete Outputs
  - Discrete Inputs
  - Temperature Sensors
    - AD590s sensors provided (up to 4 per instrument)
  - Electrical Power Switches – 2 redundant, over-current-protected, solid state relays per payload

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- **Spacecraft to Instrument Interface/Control Flight Software**
  - provided by Flight System

- **Instrument Flight Software Hosted on Spacecraft Processor**
  - developed to Flight System/Project/Mission Assurance standards by instrument teams

- **Instrument Internal Software**
  - provided by instrument teams

- **Processing Interfaces**
  - 20 MIPS CPU Utilization Composite Allocation to Payloads
  - Memory Allocations TBD
    - 256 Mb EEPROM (Total) on FPC card
    - 128 Gb (Total) DRAM on FPC Card
    - Solid State Data Recorder (100 Gb total payload allocation)

Instrument UNIX Workstation

Instrument-Provided 28V power supply

Spacecraft Side

Instrument Side

Loop Back Cable

Orbiter or Instrument
EDU or Testbed Hardware
May be Inserted Here

Payload
Integration Card

- **Provide a card that 'mimics' both sides of electronic interfaces early**
  - **LVDS, discrete, power switching PIC card and loop back cable (provided by flight system team Spring '03)**
  - **Software interface drivers (provided by flight system team)**
  - **SUN workstation running VX Works (provided by instrument team)**
- **Supports software simulation of payload**
  - **can be used to measure 'expected' characteristics of interface**

Instrument DELIVERABLES:

Payload I/F Software Model Inputs
- Compatible with all 3 test beds
- LMA will develop using inputs from
    Instruments

Instrument I/F Simulator (per PIP)
- compatible with OTB & ATB

Instrument EM and GSE (per PIP)
- compatible with OTB & ATB

FIGHT SYSTEM TESTBEDS:

Soft Sim Test Bed: Software simulation models

Orbiter Test Bed (OTB) : command/data, discrete I/O's, temp sensors

Avionics Test Bed (ATB) : command/data, discrete I/O's, temp sensors & power

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- **Pointing**
  - Baseline Orbiter capability differs from HIRISE request
  - CRISM represents disturbances which were not previously accounted for in the Orbiter concept
  - To be worked next Wednesday at LMA/Denver
- **Data Management**
  - Data compression on Orbiter computer?
  - Thumbnails or data sampling?
  - Data storage allocation process
  - Data transmit/retransmit strategy
  - To be worked following Ben Jai's presentation on Friday?

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- **Integration and Test**
  - Calibration Needs
  - Contamination Control
  - Co-alignment between instruments (Cruise calibration?)
- **Coordinated Observation**
  - Data Acquisition Strategy
  - Co-registration of data sets
- **Optical System Design**
  - Need Project-level requirements for Image Quality
  - Allocations between Flight Control/Knowledge Capabilities vs. Ground Post-processing

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